

Reproductive Biology Section

Low hypoosmotic swelling test scores correlate better with lower percent motility than any other abnormal semen parameters

J.H. Check, D. Kramer, W. Hourani, A. Bollendorf

*The University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School at Camden
Cooper Hospital/University Medical Center, Department of Obstetrics and Gynecology
Division of Reproductive Endocrinology & Infertility, Camden, NJ (USA)*

Summary

Purpose: To determine if any single abnormal semen parameter is associated with low hypoosmotic swelling (HOS) test scores. **Methods:** A retrospective review evaluating males with single sperm defects of sperm concentration, % progressive motility, morphology using strict criteria, and antisperm antibodies. The percentage of these males with HOS test scores < 50% was then determined. **Results:** By far the abnormal semen parameter most associated with a subnormal HOS test was poor motility. **Conclusions:** Though we believe that the simple inexpensive HOS test should be performed routinely when performing semen analysis, it is especially important to evaluate in males with poor motility since simple intrauterine insemination will not allow pregnancies.

Key words: Hypoosmotic swelling test; Motility; Antisperm antibodies; Sperm concentration.

Introduction

Despite years of investigating normal and abnormal semen parameters, standard semen parameters have failed to reliably identify the subfertile male with the exception of extremely poor sperm concentration or motility [1]. A test that is very reliable in identifying the subnormal male is a low hypoosmotic swelling (HOS) test score < 50% [2]. In contrast to most other subnormal semen parameters which inhibit fertilization of the oocyte, sperm with a subnormal HOS test allows normal fertilization of the oocytes but creates normal appearing embryos that do not implant [3-10].

A subnormal HOS test can exist as the sole subnormal semen parameter or co-exist with other abnormalities [2]. The present study evaluated single semen parameter abnormalities of sperm concentration, motility, and morphology using strict criteria or antisperm antibodies to determine if any one of these abnormalities is more associated with low HOS scores than other defects.

Materials and Methods

A 10-year retrospective review of semen analyses was performed. Males with single sperm parameter defects were identified as follows: concentration < 20 x 10⁶/ml, progressive motility < 50%, morphology using strict criteria < 4%, antisperm antibodies > 50%.

The frequency of associated low HOS test scores < 50% with each of these single sperm defects was then determined. Motility defects were further subdivided into four motility percentages and subnormal HOS test frequency was then determined according to these subdivisions.

Results

Table 1 shows that subnormal percent motility was the category that was most associated with a subnormal HOS test score. An abnormal HOS test score was found in 14.2% (63/443) of males with % motility < 50% vs 2.7% (23/831) of males with the combination single defects of concentration, morphology or antisperm antibodies ($p < 0.0001$, chi-square analysis).

In fact low HOS test scores were found in 25.8% (29/112) of males whose motility was < 40% (Table 2). However even in the 40-49.9% range of motility there were twice as many having low HOS test scores compared to all the other abnormal sperm categories combined.

Discussion

Based on the fact that intracytoplasmic sperm injection corrects the implantation disorder associated with low HOS test scores it has been hypothesized that the infertility problem is caused by the transfer of a toxic factor that impairs the functional integrity of the sperm membrane to the zona pellucida by the supernumerary sperm that attach which in turn become incorporated in the embryo membrane. These events thus lead to this toxic factor impairing the functional integrity of the embryo membrane and thus impair the embryo from implanting [10]. Support for this hypothesis was provided by showing that the avoidance of zona pellucida contact by performing ICSI markedly improves pregnancy rates [11, 12].

Based on the fact that treatment of the sperm with the protein digestive enzyme chymotrypsin can improve the HOS test score and achieve pregnancies, it has been hypothesized that the toxic factor is a protein and may be provided by the ejaculatory ducts rather than in the testes [11, 13, 14].

Table 1. — Frequency of low hypoosmotic swelling tests with other single defects in semen parameters.

Abnormal semen parameters	No. of males	No. of males with low HOS test scores	% of males with low HOS test scores
Low concentration	212	4	1.9
Low % progressive motility	443	63	14.22
Morphology			
< 5%	487	12	4.52
< 2%	57	2	3.51
Antisperm antibodies	132	7	5.3

Table 2. — Frequency of low hypoosmotic swelling test scores according to the degree of motility impairment.

% of sperm with progressive motility	No. in group	No. with low HOS test scores	% with low HOS test scores
0-19.9%	9	3	33.30
20.0-29.9%	20	6	30.00
30.0-39.9	83	20	24.10
43.0-49.9	331	34	10.27

The data from this study suggest that this hypothesized toxic protein may also impair motility but not sperm concentration. Moreover these data suggest that this toxic protein is not an antisperm antibody.

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Address reprint requests to:
J.H. CHECK, M.D., Ph.D.
7447 Old York Road
Melrose Park, PA 19027 (USA)
e-mail: laurie@ccivf.com